

A.3.9 AOC 16

The OWSS (AOC 16) consists of approximately 11 miles of underground piping that connects the tank basins and process areas to the ETP. The OWSS, which was constructed prior to 1950, is used to convey process water and stormwater runoff from process areas and tank basins to the ETP located in the North Field. The OWSS in the North Field/Main Yard and Central Yard flow to the ETP via gravity. Stormwater collected in the East Yard is pumped to the ETP.

The OWSS has been the subject of two major investigations. These include:

- *1st-Phase Oily Water Sewer System Investigation Report RCRA Corrective Action Module #3*. (Chevron, September 1997); and,
- Phase II OWSS Investigation – (March 2002).

The sampling strategy during the Phase II OWSS was modified to target potential groundwater impacts. One groundwater sample was collected at each of the proposed sampling points, and soil samples were to be collected from the vadose zone if evidence of environmental impacts were observed. Groundwater samples were obtained from the first water-bearing zone using NJDEP's Alternate Groundwater Sampling Technique 4.0. Samples collected for VOC or SVOC analyses were collected using a bailer after slotted PVC was driven to depth. Porous media and a peristaltic pump were used to collect samples to be analyzed for metals.

As summarized in Table A.3.9, a large number of samples (approximately 60 soil samples and 70 groundwater samples) were collected and analyzed as part of the two OWSS Investigations¹. The results are discussed in detail in the two reports referenced above. In addition, soil samples were collected from monitoring wells that were installed during the Full RFI. Some of these monitoring wells were primarily installed to investigate site-wide groundwater flow and are not necessarily located near SWMUs and AOCs (including the AOC 16 OWSS sewers), but in some cases, they were specifically installed to confirm findings from the OWSS Investigations. The five OWSS segments in the Central Yard (CY2 through CY6) are depicted on Figures A.3.9a through A.3.9e.

As discussed further in Section 6 of the RFI Report, lateral delineation of selected COCs has been completed on a site-wide basis for each Yard. The delineation of these COCs is depicted graphically on the figures provided in Section 6.

A summary of findings for each segment is provided below.

¹Relevant data from nearby SWMUs, AOCs and PAOCs are generally not included on Table A.3.9 because of the large number of samples that are already summarized on Table A.3.9, and because the five Central Yard OWSS segments encompass nearly all of the Central Yard. Sections 6 and 8 of the RFI Report contain a broader overview of soils and groundwater respectively.

CY1

Investigation Area CY1 is located in the northern section of the Central Yard. OWSS lines within CY1 were constructed of vitrified clay or concrete approximately 30 to 40 years ago and serve mostly as pipe trench drainage or process drainage originating from the Alkylation Unit, Catalytic Cracking Unit and Catalytic Reformer Unit No. 2, which have all been demolished. Because of the unusual shape of CY1 and the association of the transport load with that of the demolished process units in Investigation Areas CY4 and CY6, the segments present in CY1 were incorporated into Investigation Areas CY4 and CY6.

CY2

Investigation Area CY2 is located in the Central Yard Tank Field and includes Tanks 18, 19, 22, 23, 27 and 28. CY2 is bordered by State Street to the east, Investigation Area CY3 to the south, Investigation Area CY6 to the west and Maurer Road to the north.

Thirteen hydropunch samples and two soil samples were collected from CY2 during the Phase II OWSS, and one soil sample was collected during the Full RFI, to evaluate the presence of stained soil, odor and/or elevated PID readings at several locations. The following samples have been collected to evaluate potential releases from the CY2 OWSS segment:

Constituents of Concern	Phase I OWSS		Phase II OWSS		Full RFI	
	Soil	Water	Soil	Water	Soil	Water
VOCs	0	0	2	13	1	0
SVOCs	0	0	2	13	1	0
Metals	0	0	2	13	1	0
TPH	0	0	2	0	0	0

Soils

Surface Soils (0 to 2 feet bgs)

Staining, odors and other evidence of petroleum-related impacts were noted in surface soils at five of the 14 borings installed in CY2 as part of the OWSS Investigations.

Subsurface Fill Materials: (>2 feet bgs)

Staining, odors or other evidence of petroleum-related impacts were noted in 10 of the CY2 borings. In general, the thickness of the fill layer ranges from approximately five to 10 feet. With the exception of naturally-occurring iron, no constituents were detected above the applicable soil delineation criteria in any of the three subsurface fill samples collected from CY2.

Native Soils

A clay/silt/sand layer underlies the fill material at depths ranging from approximately five to 10 feet bgs at Investigation Area CY2. No evidence of potentially-impacted soils was noted in native materials in any of the CY2 borings, although a PID reading of 55.6 ppm was noted in the clay layer at H0294.

Groundwater

Benzene was detected at low concentrations ($<10 \mu\text{g/L}$) in two of the hydropunch samples (H0286 and H0288). Metals, including arsenic, cobalt, lead and nickel, were the only other analytes to exceed the delineation criteria in groundwater hydropunch samples. These samples were collected using porous media (Phase II), and based on a comparison of samples collected with porous media to samples collected using low flow techniques from nearby monitoring wells, SVOC and metals data are not considered to be representative of ambient groundwater conditions. These constituents are evaluated as part of the site-wide groundwater evaluation in Section 8 of the RFI Report.

Summary

Although some petroleum-related impacts were noted in the fill material within Investigation Area CY2, there were no exceedances of the applicable delineation criteria in soils, except for naturally-occurring iron. Potentially-impacted soils noted in some of the borings at CY2 do not appear to be a significant source of ongoing contamination and are only found in the surface soil and fill material, with no exceedances of the criteria except for naturally-occurring iron. Nonetheless, potentially impacted groundwater at CY2 will be evaluated further as part of the site-wide groundwater evaluation in the CMS.

CY3

Investigation Area CY3 is located in the Central Yard Tank Field. CY3 is bounded by Investigation Areas CY2, CY5 and CY6 to the north, State Street to the east, Garretson Avenue to the south, and the Pennsylvania Railroad to the west. A total of 27 hydropunch borings were installed during the Phase II OWSS Investigation in CY3. Four soil samples were also collected from this area during the Phase II OWSS Investigation, and twelve soil samples and two groundwater samples were collected during the Full RFI. The following samples have been collected to evaluate potential releases from the CY3 OWSS segment:

Constituents of Concern	Phase I OWSS		Phase II OWSS		Full RFI	
	Soil	Water	Soil	Water	Soil	Water
VOCs	0	0	4	27	6	2
SVOCs	0	0	4	27	6	2
Metals	0	0	4	27	6	2
PAHs	0	0	0	0	6	0
TPH	0	0	4	0	0	0

Soils

Surface Soils (0 to 2 feet bgs)

Staining, odors and other evidence of petroleum-related impacts were noted in surface soils at several of the borings installed in CY3 as part of the OWSS Investigations. Benzo(a)pyrene (2.3 mg/kg and 17 mg/kg) and two other PAHs were detected above the applicable delineation criteria in two of the seven surface soil samples collected from CY2 (S1402A1 and S0485, respectively).

Subsurface Fill Materials: (>2 feet bgs)

Staining, odors or other evidence of petroleum-related impacts were noted in the subsurface fill material at several of the CY3 borings. In general, the thickness of the fill layer ranges from approximately one to 16 feet. Benzo(a)pyrene (6.7 mg/kg) and several other PAHs were detected above the soil delineation criteria in one of the subsurface fill samples (S1402B1), and lead (507 mg/kg) was detected above the applicable soil delineation criterion in sample S0813B2. There were no exceedances in the other two subsurface fill samples collected from CY3.

Native Soils

A clay/silt/sand layer underlies the fill material at depths ranging from approximately one to 16 feet bgs at Investigation Area CY3. No evidence of potentially-impacted soils was noted in native materials in any of the CY3 borings, and there were no exceedances of the soil delineation criteria, other than naturally-occurring iron, in any of the six soil samples collected from the native material at CY3. Therefore, the exceedances in soil have been vertically delineated.

Groundwater

Benzene was detected above the applicable groundwater delineation criterion at one location (H0281) at 7 µg/L, and bis(2-ethylhexyl)phthalate² (130 µg/L and 46 µg/L) was detected above the groundwater delineation criterion at two locations (H0271 and H0274, respectively). Several metals, including arsenic, lead and nickel, were also detected above the delineation criteria in many of the CY3 water samples. These samples were

²The presence of bis(2-ethylhexyl)phthalate could be an artifact of sampling and/or analytical procedures, as this compound is found in many plastics.

collected using porous media (Phase II), and based on a comparison of samples collected with porous media to samples collected using low flow techniques from nearby monitoring wells, SVOC and metals data are not considered to be representative of ambient groundwater conditions. For example, lead (1,040 µg/L) was the only compound detected above the applicable groundwater criterion in the sample collected with porous media from H0270, but it was not confirmed in the groundwater sample collected in October 2002 from MW-106 using low-flow sampling techniques.

N-nitroso-di-n-propylamine (73 µg/L) and arsenic (297 µg/L) were detected above their applicable groundwater delineation criteria in the October, 2002 groundwater sample from MW-129. Cobalt (153 µg/L) and nickel (170 µg/L) were the only constituents detected above their applicable groundwater criteria in the groundwater sample from MW-106. These constituents are evaluated as part of the site-wide groundwater evaluation in Section 8 of the RFI Report.

Summary

Benzo(a)pyrene and several other PAHs were detected above their applicable delineation criteria in several fill samples collected from Investigation Area CY3. Lead was also detected above its applicable delineation criterion in one of the fill samples collected from MW-129, which is located in the parking lot between State Street and the Pennsylvania Railroad. Therefore, both soils and potentially-impacted groundwater at Investigation Area CY3 will be included for further evaluation in the CMS.

CY4

Investigation Area CY4 is situated within the northwest portion of the Central Yard, and is bordered by Maurer Road to the north, Investigation Area CY6 to the east, Investigation Area CY5 to the south, and the Pennsylvania Railroad to the west. A total of 31 soil samples and three groundwater samples have been collected from CY4. In addition, as discussed in more detail in Section 7 of the RFI report, LNAPL area AOC 25 is located in the middle of CY4.

The following samples have been collected to evaluate potential releases from the CY4 OWSS segment:

Constituents of Concern	Phase I OWSS		Phase II OWSS		Full RFI	
	Soil	Water	Soil	Water	Soil	Water
VOCs	4	0	0	2	3	1
SVOCs	4	0	24	2	3	1
Metals	4	0	0	0	3	1
Water Quality	0	0	0	0	0	1

Soils

Surface Soils (0 to 2 feet bgs)

There was limited evidence of petroleum-related impacts noted in surface soils in the borings installed in CY4 as part of the OWSS Investigations, with the exception of a trace odor noted at SB0244 at zero to six feet. Benzo(a)pyrene (3.8 mg/kg) and several other PAHs were detected above the applicable delineation criteria in the surface soil sample from MW-147 (S0851A2/A4).

Subsurface Fill Materials: (>2 feet bgs)

Staining, odors or other evidence of petroleum-related impacts were noted in the subsurface fill material at several of the CY4 borings. In general, the thickness of the fill layer ranges from approximately zero to 14 feet. Benzo(a)pyrene (3.8 mg/kg) and several other PAHs were detected above the soil delineation criteria in soil sample SB0244SC. Benzo(a)pyrene (0.8 mg/kg) was also detected above the applicable soil delineation criterion in soil sample SB0245SE. Benzenethiol (22 mg/kg), 2,4-dimethylphenol (11 mg/kg), and phenol (67 mg/kg) were detected in the unsaturated soil sample from SB0246. There were no other exceedances in the 17 other fill samples.

Native Soils

A clay/silt/sand layer underlies the fill material at depths ranging from approximately zero to 14 feet bgs at Investigation Area CY4. No evidence of potentially-impacted soils (other than odors) were noted in native materials in the CY4 borings, and there were no exceedances of the soil delineation criteria, other than naturally-occurring iron, in any of the ten soil samples collected from the native material at CY4. Therefore, the exceedances in soil have been vertically delineated.

Groundwater

Benzene (16 µg/L) was detected above the applicable delineation criteria in one of the groundwater samples (H0519), which is downgradient of the AOC 25 LNAPL area. No COCs were detected above the applicable groundwater delineation criteria in the October 2002 groundwater sample from monitoring well MW-147. The distribution of organics in groundwater is discussed in greater detail in Section 8 of the RFI Report.

Summary

LNAPL Area AOC 25 is located in the middle of CY4. Benzo(a)pyrene and several other PAHs were detected above their applicable delineation criteria in several fill samples collected from Investigation Area CY4, and benzene was detected above its applicable groundwater delineation criterion in one of the groundwater samples from CY4. Therefore, both soils and potentially-impacted groundwater at Investigation Area CY4 will be included for further evaluation in the CMS.

CY5

Investigation Area CY5 is located in the central section of the Central Yard and includes the area of the demolished Catalytic Reformer Unit Process Drainage System. A total of five soil samples and three groundwater samples were collected from CY5 during the Phase I OWSS, as shown on Figure A.3.9d. The following samples have been installed to evaluate potential releases from the CY5 OWSS segment:

Constituents of Concern	Phase I OWSS		Phase II OWSS		Full RFI	
	Soil	Water	Soil	Water	Soil	Water
VOCs	5	3	0	0	0	0
SVOCs	5	3	0	0	0	0
Metals	5	3	0	0	0	0

Soils

Surface Soils (0 to 2 feet bgs)

No evidence of petroleum-related impacts was noted in surface soils at CY5. No COCs were detected above the applicable soil delineation criteria in the surface soil sample (SB0242) collected from CY5.

Subsurface Fill Materials: (>2 feet bgs)

No staining, odors, or other evidence of petroleum-related impacts were noted in the subsurface fill material at CY5. In general, the thickness of the fill layer ranges from approximately two to eight feet. There were no other exceedances in any of the four subsurface fill samples.

Native Soils

A clay/silt/sand layer underlies the fill material at depths ranging from approximately two to eight feet bgs at Investigation Area CY5. No evidence of potentially-impacted soils was noted in native materials in the CY5 borings.

Groundwater

Benzene (4 µg/L) was detected at HP0067 and 1,2-dichloroethane (75 µg/L) was detected at HP0065. Numerous exceedances of metals were detected in all three groundwater samples. These samples were collected using traditional hydropunch methodology (Phase I) and, based on a comparison of hydropunch samples to samples from nearby monitoring wells, SVOC and metals data are not considered to be representative of ambient groundwater conditions. The distribution of organics in groundwater is discussed in greater detail in Section 8 of the RFI Report.

Summary

No staining, odors, or elevated PID readings were observed in any of the eight borings, and the delineation criteria were not exceeded in any of the soil samples. Therefore, the fill at CY5 does not appear to be a significant source of ongoing contamination and no further action for soils is recommended. However, potentially impacted groundwater at CY5 will be evaluated further as part of the site-wide groundwater evaluation in the CMS.

CY6

Investigation Area CY6 (and part of CY1) is located in the northern section of the Central Yard and includes the site of the demolished Alkylation Unit Process Sewer. The eastern portion of Investigation Area CY1 that included trench areas and a series of LPG spheres were incorporated into Investigation Area CY6. A total of eight soil samples and three groundwater hydropunch samples were collected from CY6 during the Phase I and Phase II OWSS Investigations, respectively. The lithologic and analytical data for these samples are summarized on Table A.3.9.

The following samples have been installed to evaluate potential releases from the CY6 OWSS segment:

Constituents of Concern	Phase 1 OWSS		Phase 2 OWSS		Full RFI	
	Soil	Water	Soil	Water	Soil	Water
VOCs	8	0	0	3	0	0
SVOCs	8	0	0	3	0	0
Metals	8	0	0	0	0	0

Soils

Surface Soils (0 to 2 feet bgs)

Some staining was noted in surface soils at two of the CY6 boring locations (SB0249 and SB0259). No COCs were detected above the applicable soil delineation criteria in the surface soil sample (SB0237) collected from CY6.

Subsurface Fill Materials: (>2 feet bgs)

Some staining, odors, or other evidence of petroleum-related impacts were noted in the subsurface fill material at several of the CY6 borings. In general, the thickness of the fill layer ranges from approximately five to 12 feet. There were no other exceedances in any of the seven subsurface fill samples.

Native Soils

A clay/silt/sand layer underlies the fill material at depths ranging from approximately five to 12 feet bgs at Investigation Area CY6. No evidence of potentially-impacted soils was noted in native materials in the CY6 borings.

Groundwater

There were no exceedances of the delineation criteria in any of the three groundwater samples from CY6.

Summary

Although some staining, odors and/or elevated PID readings were observed in four of the fifteen borings, the applicable soil delineation criteria were not exceeded in any of the eight soil samples. Therefore, the fill at CY5 does not appear to be a significant source of ongoing contamination. There were no exceedances of the delineation criteria in any of the three groundwater samples from CY6. Therefore, no further action is recommended for Investigation Area CY6.